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# A new species of genus *Nippononebria* Uéno (Coleoptera, Carabidae, Nebriini) from Changbai Mountain, Jilin Province, China, the first species of the genus confirmed from the Asian mainland

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## Abstract

The authors describe a new species, *Nippononebria changbaiensis* **sp. n.** (type locality: Changbai Mountain, 42.034004°N, 128.055854°E, 2000–2600 m, Jilin Province, PR China), which represents the first confirmed record of the genus from the Asian mainland. They also provide a review of the taxonomic history of the genus and a key for distinguishing adults of subgenus *Nippononebria* species.

## Keywords

Carabidae, Nebriini, *Nippononebria*, China, Changbai Mountain

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## Introduction

*Nippononebria* was first described by Uéno (1955) as a subgenus of *Nebria* Latreille (1802) to include two Japanese species, *Nebria chalceola* Bates (1883) and *Nebria pusilla* Uéno (1955), both from Honshu Island, with the latter designated as type species. Habu (1958) revised *Nippononebria*, recognized it as a distinct genus, and described a new species, *Nippononebria kyushuensis*, from Kyushu Island, and a new subspecies, *Nippononebria pusilla teres*, from Honshu Island. Nakane (1960) described two new subspecies, *Nippononebria chalceola horioi* and *Nippononebria pusilla yatsuana*, and later (Nakane 1979) described a new species, *Nippononebria sawadai*. All three of these taxa were recorded from restricted areas on Honshu Island. Subsequently, *N. pusilla teres* has been recognized as a junior synonym of *N. pusilla pusilla* (Uéno) (Habu 1975), and *N. kyushuensis* has been treated as either a distinct species (Lorenz 2005) or as a subspecies of *N. chalceola* (Nakane 1974; Ledoux and Roux 2005). As a result of this taxonomic history, the known *Nippononebria* fauna, as recently as the mid-1990s, comprised only three or four species, two of them represented by two or three subspecies, all of them restricted to the islands of Japan, and all but one of these taxa (*N. kyushuensis*) restricted to Honshu Island.

Kavanaugh (1995) broadened the generic concept of *Nippononebria* by including three western Nearctic species, *Nebria virescens* Horn (1870), *Nebria altisierrae* Kavanaugh (1984), and *Nebria campbelli* Kavanaugh (1984), in a new subgenus, *Vancouveria*. Although members of these Nearctic species differ from those of species of subgenus *Nippononebria* in some conspicuous features, such as in having antennomere 4 [mistakenly cited repeatedly as "antennomere 3" in Kavanaugh (1995)] without (or with extremely sparse) pubescence on the apical one-third, (the apical one-third of antennomere 4 is distinctly pubescent in members of the nominate subgenus), numerous characters of external and male and female genitalic form and structure suggest very close phylogenetic relationship between these taxa. Ledoux and Roux (2005) recognized this close relationship but ranked these taxa as different subgenera of genus *Nebria*, based on their hypothesis of relationships among *Nebria* subgenera. Lorenz (2005) followed Habu (1958) in treating *Nippononebria* as a genus distinct from *Nebria* and included *Vancouveria* as a subgenus of *Nippononebria*, a classification with which we agree. As thus conceived, *Nippononebria* was a genus with a north-temperate trans-Pacific distribution, with the Nearctic component restricted to the west coast of North America, from southern British Columbia to central California, and the known Palaearctic component restricted to Honshu and Kyushu Islands of Japan.

In 1992, Li and Liang (Li 1992) described a new species of *Nippononebria* from Jilin Province, China under the name *Nipponebria* [sic] *xiaoxinganensis*. Thierry Deuve, of the Museum National d'Histoire Naturelle in Paris, identified the holotype as a specimen of *Diacheila polita* Faldermann, a member of the tribe Elaphrini, in 1999; and Ledoux et al. (2003) formally established this synonymy. So this first record of *Nippononebria* from the Asian mainland proved invalid. However, in 1998, while sorting through undetermined carabid material in the collection of the Institute of Zool-

ogy of the Chinese Academy of Sciences in Beijing, the senior author noticed two unusual *Bembidion*-sized specimens among materials collected by Professor Peiyu Yu and her assistant on remote Changbai Mountain, Jilin Province, in July 1987. Careful examination of these specimens revealed that they are nebriines with nearly all of the external features characteristic of members of *Nippononebria* (*sensu stricto*), but also with several features distinguishing them from members of all previously described species. Subsequent genitalic dissections have confirmed both basic similarities with other *Nippononebria* members and differences from them.

The purpose of this contribution is to describe this new species of *Nippononebria*, provide a key for distinguishing members of this species from those of other known species in subgenus *Nippononebria*, and report this first valid record for the genus on the Asian mainland.

## Materials and methods

Specimens examined are housed in the California Academy of Sciences, San Francisco, U.S.A (CAS) and the National Zoological Museum of China, Institute of Zoology, Beijing, China (IOZ).

Methods used in the present study, including dissection techniques and criteria for ranking taxa as distinct species, were as described in Kavanaugh (1979). The only measurements used are: standardized body length (SBL), which equals the sum of the lengths of the head (measured from apex of clypeus to a point on midline at level of posterior margin of compound eye), pronotum (measured from apical margin to basal margin along midline), and elytra (measured along midline from apex of scutellum to apex of the longer elytron); and ratio of pronotal width (transverse width across pronotum measured at the widest point) to pronotal length (distance from anterior margin to posterior margin measured along midline (i.e. not including apical and basal angles)). Digital photographs of dorsal habitus, pronotum, and male genitalia were taken using an Automontage imaging system by Syncroscopy with a Leica M420 dissecting microscope.

## Taxonomy

***Nippononebria changbaiensis* Kavanaugh & Liang, sp. n.**
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Figs. 1–5

**Type locality.** PEOPLES REPUBLIC OF CHINA, Jilin Province, Changbai Mountain, 42.034004°N, 128.055854°E

**Type material.** Holotype, a male, deposited in IOZ, labeled: "Jilin Province, Changbaishan, Tianchi, waterfall, 2000–2600m, Chinese Academy of Sciences" [part-

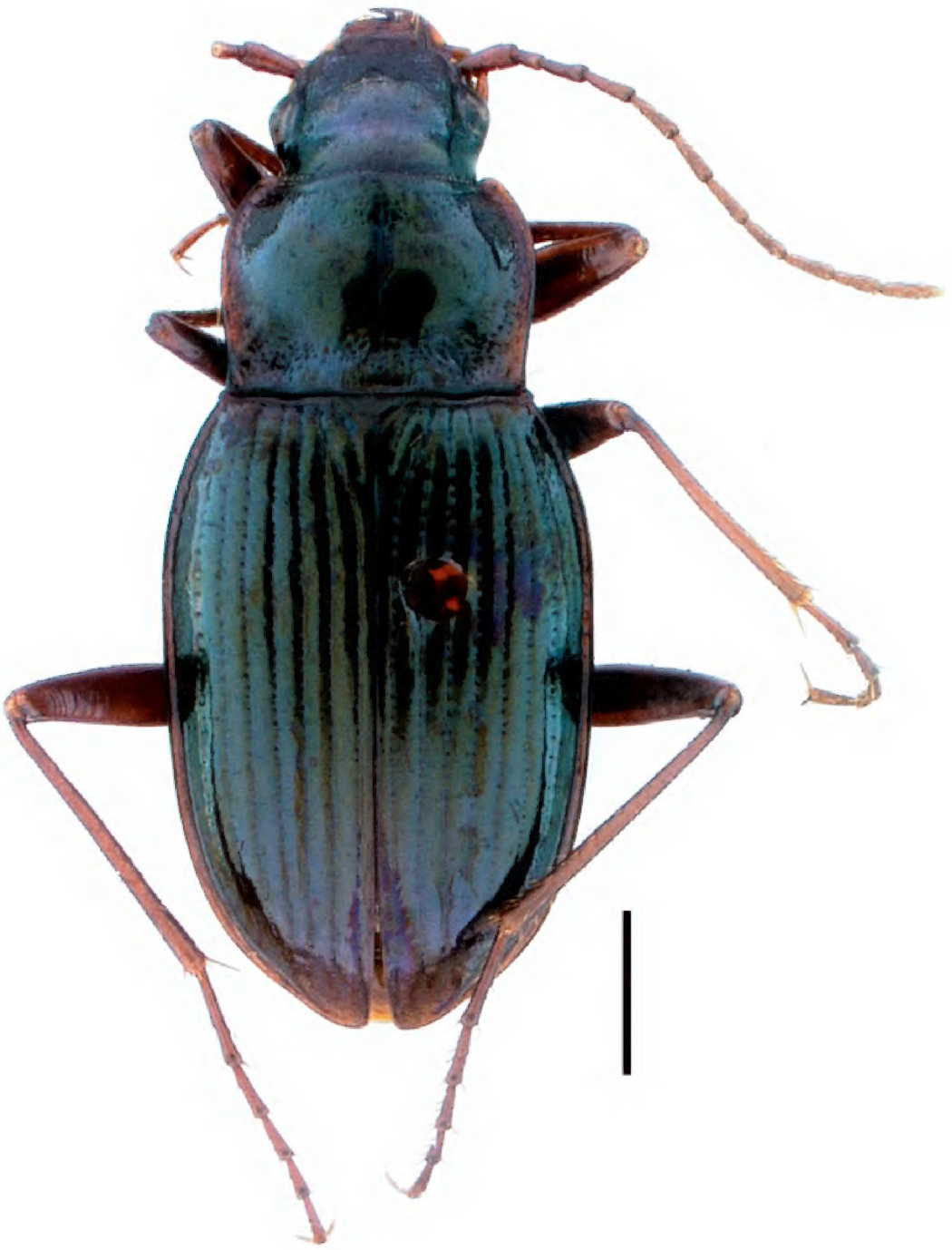

**Figure 1.** Holotype male, *Nippononebria changbaiensis* sp. n., dorsal habitus. Scale line = 1.0 mm.

ly in Chinese]/ "1987.VII.22, Guiyun Deng collector" [partly in Chinese] / "HOLOTYPE *Nippononebria changbaiensis* Kavanaugh & Liang sp. n. designated 2010" [red label] (Fig. 2A). Paratype, a male, deposited in CAS, labeled: "Jilin Province, Changbaishan, Tianchi, 2000m, Chinese Academy of Sciences" [partly in Chinese]/ "1987. VII.22, Peiyu Yu collector" [partly in Chinese]/ "PARATYPE *Nippononebria changbaiensis* Kavanaugh & Liang sp. n. designated 2010" [yellow label] (Fig. 2B).

**Etymology.** The species epithet is an adjective in the nominative singular derived from the name of the type locality, Changbai Mountain, and referring to it.

**Diagnosis.** Adults of this species can be distinguished from those of all other species of subgenus *Nippononebria* by the following combination of character states: size very small (SBL of male less than 6.5 mm); head, pronotum, and elytra shiny, with faint but distinct blue-green metallic reflection; pronotum relatively short and broad, distinctly wider than head across eyes, ratio of pronotal width to length = 1.4–1.5,

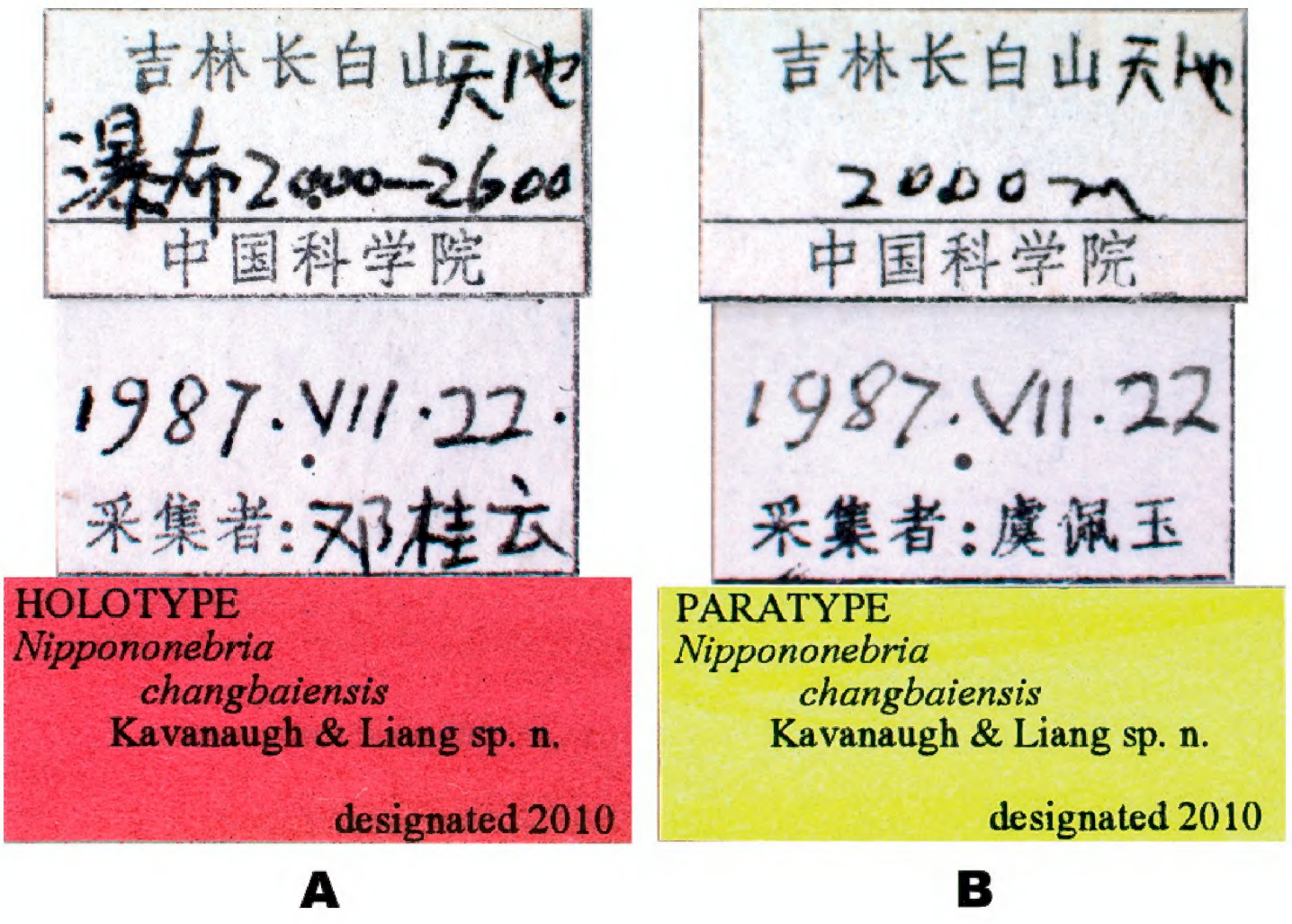


**Figure 2.** Photographs of labels for type specimens of *Nippononebria changbaiensis* sp. n. **A** Holotype **B** Paratype.

basal margin distinctly wider than apical margin, with basal sinuation of lateral margin long and shallow, basal angles rectangular, lateral explanation narrow anteriorly and at middle, markedly broadened basally; elytral silhouette subovoid, relatively short, widest distinctly anterior to middle, elytral microsculpture comprised of moderately impressed and markedly transverse meshes, humeral carina and tooth slightly developed, striae markedly punctate, intervals very slightly and smoothly convex; hindwings full-sized; thorax coarsely punctate ventrally (most distinctly so on mesepisterna and metepisterna, but also on prosternum and proepisterna anteriorly, on mesosternum, and on metasternum laterally).

**Description.** Body (Fig. 1) size very small for a *Nippononebria* or a nebriine, SBL males 5.8–6.0 mm; head piceous or reddish brown, without pale spot or spots on vertex, pronotum and elytra piceous or reddish-brown, legs brown or reddish-brown, venter brown or reddish-brown; dorsum with faint but distinct metallic blue-green reflection (most evident on elytra), venter without metallic reflection; frons smooth or slightly punctate laterally, vertex smooth or nearly so; head slightly shiny, pronotum and elytra markedly shiny, microsculpture on frons and pronotum faintly impressed with sculpticells comprised of broken isodiametric meshes, microsculpture on elytra moderately impressed with sculpticells comprised of markedly transverse meshes.

*Head.* Size and width relative to pronotum average for genus. Genae and occiput not inflated, head very slightly constricted behind eyes. Eyes medium in diameter and

convexity for genus. Vertex with one pair of supraorbital setae. Antennae moderately elongate; scape slightly short and slightly arcuate, markedly narrowed basally, with one anterodorsal seta subapically; pedicel with one ventral seta subapically; flagellar antennomeres moderately elongate, medium width, antennomeres 3 and 5 subequal in length, antennomere 4 with apical one-third distinctly pubescent, antennomeres 5 to 11 distinctly pubescent. Labrum with apical margin truncate or slightly concave, with four or five setae. Clypeus with apical margin truncate or slightly concave. Glossal sclerite (ligula) with apicoventral margin moderately and bluntly toothed, with one pair of ligular setae apicoparamedially; paraglossae separate, minute, dentiform. Labium with penultimate labial palpomere trisetose anteriorly, minutely unisetose posteroapically. Submentum with two pairs of lateral setae and one pair of medial setae.

*Pronotum*. Size relative to elytra large, markedly wide, and slightly short for genus; shape (Fig. 3) subquadrate, markedly convex, basal margin distinctly wider than apical margin; lateral margins slightly arcuate, with basal sinuation long and shallow; lateral explanation present throughout pronotal length, narrow anteriorly and at middle, markedly broadened basally; basal margin straight; apical angles moderately long, slightly narrow, and moderately rounded; basal angles rectangular or slightly acute, not projected posteriorly, not apically dentate; lateral margination (also called "lateral bead") uniformly present throughout, moderately wide and moderately impressed; anterior margination present in lateral 30–40%, absent medially, moderately wide and moderately impressed; anterior transverse impression broad and slightly shallow; posterior transverse impression narrow and very deep; basal foveae deep, extremely broad, slightly divergent basally, without or with a faint and broad tubercle medially; one pair each of midlateral and basolateral setae present.

*Thoracic venter*. Prosternal intercoxal process moderately lanceolate, smooth, with margination of intercoxal process present and complete both laterally and apically, asetose. Prosternum and proepisternum sparsely and coarsely punctate anteriorly. Mesosternum sparsely punctate laterally. Metasternum slightly short, sparsely punctate laterally, margination of anterior intercoxal process complete, broad, and deeply impressed. Mesepisternum and metepisternum sparsely and coarsely punctate.

*Elytra.* Markedly shorter in relation to length of forebody than average for genus, moderately wide, moderately convex laterally and flattened medially; elytral silhouette (Fig. 1) subrectangular, widest near basal one-third; basal marginations very long, straight or slightly concave; humeri angulate, slightly rounded, humeral carinae markedly distinct and sharp, moderately projected, humeral teeth present; subhumeral sinuation absent; subapical sinuation absent or very shallow; elytral apices at midline, bluntly pointed; elytral striae moderately deep, markedly punctate, scutellar striole short, extended independently from basal margination medial to stria 1; elytral intervals slightly convex, smooth, and without catenations, basal (parascutellar) setiferous puncture present, interval 3 with two or three setiferous pores, intervals 5 and 7 without setiferous pores, interval 9 with umbilicate series comprised of five to seven setiferous pores, all elytral setiferous pores barely evident or only faintly foveate.

*Hind wings*. Full-sized.

**Figure 3.** Holotype male, *Nippononebria changbaiensis* sp. n., pronotum, dorsal aspect. Scale line = 0.5 mm.

*Legs*. Medium length for genus; hind coxae with one seta basally and one seta apically. Hind trochanters kidney-shaped, medium length, truncate or broadly rounded apically. Middle tibiae with dorsal sulcus present, extended from near base to apical one-third, with brush of sparse setae present dorsosubapically. Tarsi with very sparse, minute setae dorsally; protarsi of males with basal three tarsomeres broadened and with pads of adhesive setae ventrally; hind tarsi with ventroapical margin of tarsomere 4 truncate.

*Abdomen*. Sternum II (first visible sternite) sparsely and coarsely punctate, other sterna impunctate; suture between sterna III and IV complete, distinct throughout; sternum III without setae; sterna IV to VI with one pair of posterior paramedial setae, without paralateral setae; sternum VII (last visible sternite) of males with one pair of posterior paramedial ("anal") setae.

*Male genitalia*. Median lobe of aedeagus (Fig. 4A–B) with basal bulb rounded and markedly closed basally, dorsobasal piece present as a large, simple mid-sagital fin dorsally; mid-shaft moderately thick, slightly narrowed basally, with its axis bent to a slightly acute (< 90 degrees) angle (in lateral aspect), circular (in cross-section), with right face of mid-shaft unmodified; preapical-shaft narrow and moderately tapered apically, ventral margin straight or slightly and smoothly concave (in lateral aspect), broad, slightly tapered basally and apically and faintly deflected right (in dorsal aspect), with apical orifice slightly deflected right (in apical aspect); apical lamella (Fig. 4A) short, narrow, narrowly rounded apically, nearly centered on preapical shaft (in ventral aspect), plane of lamellar face horizontal (in apical aspect). Parameres asymmetrical, with right slightly longer than left; right paramere (Fig. 4C) slender, more fully sclerotized apically but with more faintly sclerotized areas subapically on anterior and posterior margins; left paramere (Fig. 4D) broad, slightly narrowed and only faintly sclerotized apically.

*Female genitalia*. No female specimens are known.

**Figure 4.** Holotype male, *Nippononebria changbaiensis* sp. n., genitalia. **A** median lobe (aedeagus), ventral aspect **B** median lobe, left lateral aspect **C** right paramere, lateral aspect **D** left paramere, lateral aspect. Scale line = 0.5 mm.

**Geographical distribution.** This species is known only from the type locality, on Changbai Mountain, on the border between Jilin Province, China, and North Korea (Fig. 5).

**Habitat distribution.** According to Professor Peiyu Yu (personal communication), the two known specimens of *N. changbaiensis* likely were collected under stones above treeline on the north slope of Changbai Mountain. There is some difficulty, however, in determining the precise locations where these specimens were collected on the mountain. To the unaided eye, there is little remarkable about adults of this species, and they could readily be mistaken for adults of some *Bembidion* species (which would be both diverse and abundant in this area) rather than a nebriine; hence there would have been little reason for Professor Yu to mark their capture in memory. "Tianchi", which appears on the labels for both specimens, means "mountain lake", suggesting that they were collected near the lake that occupies the summit crater. The holotype label also mentions the "waterfall", which is a well-known feature at the head of the valley leading to the rim of the summit crater and lake. The holotype's label cites an elevation range of 2000–2600 m and the paratype's label cites an elevation of 2000 m. The level of the lake shore is at about 2200 m elevation, the base of the waterfall at about 2000 m, and the top of the waterfall and floor of the upper valley leading directly to the lake at about 2200 m. We conclude that both specimens were probably collected under stones along the stream course that includes the large waterfall, perhaps both above and below that feature. We have used this feature to estimate the geographical coordinates specified in the type locality description.

**Phylogenetic relationships.** Based on characters of external morphology and form and structure of male genitalia, *N. changbaiensis* is clearly a member of genus *Nippononebria* and of the nominate subgenus. The very small body size, unusual body shape (especially the elytral silhouette), and thoracic venter coarsely punctate laterally

**Figure 5.** Map of the Sea of Japan and adjacent land areas, showing the known geographical distribution of *Nippononebria* (*sensu stricto*) Uéno and included species: **solid yellow circle** *N. changbaiensis* sp. n. **C** *N. chalceola* (Bates) **P** *N. pusilla* (Uéno) **S** *N. sawadai* Nakane (n.b. Only exemplar localities shown for *N. chalceola and N. pusilla*). Scale line = 400 km.

distinguish members of this species from those of the Japanese species, as well as from members of all *Vancouveria* species. We found no features that suggest a closer relationship of *N. changbaiensis* to any one of the Japanese than to any other; it is probably the sister species to a clade including the three Japanese species of subgenus *Nippononebria*.

**Geographical relations with most closely related species.** The known geographical range of *N. changbaiensis*, confined to a single locality on the Asian mainland, is allopatric with respect to the ranges of the three other species of subgenus *Nippononebria*, all restricted to Japan (Fig. 5). *Nippononebria pusilla* and *N. sawadai* occur only on Honshu Island (at high elevations in restricted parts of central and northern Honshu, respectively); and *N. chalceola* ranges more widely, and at lower elevations, on both Honshu and Kyushu Islands.

## Comparisons

Adults of the four species of *Nippononebria* (*sensu stricto*) are easily distinguished using the key provided below. We have avoided the use of gender-specific characters in distinguishing the species here because females of *N. changbaiensis* are not yet known. We also take this opportunity to correct two crucial errors in Kavanaugh's (1995) key to the subgenera of *Nippononebria*. He incorrectly used the absence or extremely sparse presence of pubescence on "antennomere 3" and the presence of "two pairs of posterior paramedial setae" on abdominal sterna "III to V" (actually sterna IV to VI) to distinguish members of his new subgenus *Vancouveria* from those of subgenus *Nippononebria*. In fact, the antennomere on which the difference in pubescence occurs is antennomere 4; and, as correctly pointed out by Ledoux and Roux (2005), members of both subgenera have only one pair of posterior paramedial setae on the designated sterna. It is only on sternum VII (the so-called "apical" or "anal" sternite) of both males and females of *Vancouveria* spp. that two pairs of setae are seen in most individuals, whereas only females of *Nippononebria* spp. have two pairs of setae and males have only a single pair. We incorporate these features in our new key, couplet 1, which distinguishes the subgenera.

### Key for identification of adults of species of *Nippononebria* (*sensu stricto*) Uéno

1. Antennomere 4 without or with only extremely sparse pubescence on apical one-third; elytral apex narrowly oblique, laterally displaced from midline and posteriorly acute, sutural margin angulate at apex; male sternum VII with two pairs of posterior paramedial ("anal") setae [specimens from western Nearctic Region (Pacific Coast of North America)] ..... **subgenus *Vancouveria* Kavanaugh**

– Antennomere 4 with moderately dense pubescence on apical one-third; elytral apex bluntly pointed at midline, sutural margin straight at apex; male sternum VII with only one pair of posterior paramedial ("anal") setae [specimens from eastern Palaearctic Region (Japan and northeastern China)] **subgenus *Nippononebria* Uéno** ..... **2**

2(1). Thorax coarsely punctate ventrally (most distinctly so on mesepisterna and metepisterna, but also on prosternum and proepisterna anteriorly, mesosternum and metasternum laterally); size very small (SBL of male less than 6.5 mm); elytral silhouette (Fig. 1) subovoid, widest distinctly anterior to middle; elytral microsculpture comprised of moderately impressed and markedly transverse meshes; head, pronotum, and elytra with faint but distinct blue-green metallic reflection; hindwings full-sized..... ***Nippononebria changbaiensis* sp. n.**

– Thorax smooth, impunctate ventrally; size larger (SBL of male 6.5 mm or more, of female 6.8 mm or more); elytral silhouette varied, widest at or

slightly to markedly posterior to middle; elytral microsculpture comprised of very faintly to moderately impressed isodiametric, irregular, or slightly transverse meshes; head and pronotum without metallic reflection, elytra without or with faint metallic reflection; hindwings full-sized or reduced to less than half elytral length ..... **3**

3(2). Elytral silhouette ovoid, distinctly narrowed basally and apically, widest at middle or slightly posterior to middle, humeral carina and tooth markedly developed, elytral striae impuncate or very faintly punctate; pronotum relatively long and slender, only slightly wider than head across eyes, ratio of pronotal width to length = 1.20 to 1.35, basal margin only slightly wider than apical margin; elytral microsculpture comprised of moderately impressed broken isodiametric to irregular or slightly transverse meshes; elytra without or with faint greenish metallic reflection; hindwings reduced to small vestigial lobes ..... ***Nippononebria pusilla*** **(Uéno)**

– Elytral silhouette subrectangular or subvoid, widest at middle or slightly to markedly posterior to middle, humeral carina and tooth slightly to moderately developed, elytral striae moderately and distinctly punctate; pronotum relatively broad, distinctly wider than head across eyes, ratio of pronotal width to length = 1.4 or greater, basal margin distinctly wider than apical margin; elytra microsculpture comprised of very faintly (nearly effaced) to moderately impressed irregular or broken isodiametric or slightly transverse meshes; elytra without or with very faint greenish metallic reflection; hindwings full-sized or reduced to less than half elytral length..... **4**

4(3). Elytral silhouette subrectangular, relatively broad, widest at or very slightly posterior to middle, humeral carina and tooth slightly developed; elytral intervals smoothly convex; elytra shiny, with microsculpture comprised of nearly effaced to very faintly impressed irregular to slightly transverse meshes; elytra without or with very faint greenish metallic reflection; hindwings full-sized; pronotum with basal sinuation of lateral margin short and shallow, basal angles slightly obtuse or rectangular, lateral explanation broad throughout.....***Nippononebria chalceola*** **(Bates)**

– Elytral silhouette subovoid, relatively long and narrow, widest distinctly posterior to middle (at apical one-third in some individuals), humeral carina and tooth moderately developed; elytral intervals slightly flattened at middle; elytra slightly dull from moderately impressed broken isodiametric, irregular, or slightly transverse meshes; elytra without metallic reflection; hindwings reduced to less than half elytral length; pronotum with basal sinuation of lateral margin long and shallow to moderately deep, basal angles rectangular or slightly acute, lateral explanation narrow, especially at middle.....
.....***Nippononebria sawadai*** **Nakane**

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